

STEREO MOC Status Report
Time Period: 2015:222 - 2015:228

STEREO Ahead (STA) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- On day 223, during the DSS-55 support, the DCD1 failed over to the backup DCD2. All telemetry data was recovered. See DR# M108946 for more information.
- On day 225, initial acquisition of telemetry for the DSS-43 support occurred 13 minutes late at 2358z due to a downlink receiver issue. A second receiver was added which locked to the downlink signal. This anomaly resulted in the loss of 13 minutes of real-time data and spacecraft SSR playback data. See DR# C111318 for more information.
- On day 227, initial acquisition of telemetry for the DSS-35 support occurred 54 minutes late at 0345z as the station was declared red due to mechanical pointing issue. The antenna was re-calibrated which cleared the anomaly. This anomaly resulted in the loss of 55 minutes of telemetry, tracking, and commanding support. See DR# C111321 for more information.

2. The following spacecraft/instrument events occurred during this week. The Ahead observatory operated nominally during this week on the 2nd side lobe of the HGA to prevent overheating of the HGA feed assembly which was at 107 degrees C and decreasing with the HGA angle at 9.6 degrees and increasing, with respect to the spacecraft-Sun line.

- On day 228, at the end of the DSS-14 support, the HGA was positioned to return to the 1st HGA side lobe for communications at 1953z to increase data rates while preventing overheating of the HGA feed assembly. This increased the HGA feed assembly temperature to 121.9 degrees C, which is within the predicted range, with the HGA angle at 6.8 degrees, with respect to the spacecraft-Sun line. For the 1st side lobe, data rates for the daily 70 meter supports are 10 kbps on the downlink and 500 bps on the uplink. Data rates for the 34 meter supports remain unchanged at 633 bps down and 125 bps up.

- The average daily science data return for Ahead, while operating on the 2nd side lobe on the HGA, was 54 Mbits during this week.

STEREO Behind (STB) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- None.

2. Detailed status of the activities that occurred on the Behind loss of communication anomaly, which occurred on day 2014-274, are listed below.

- The Behind observatory entered superior solar conjunction at the 2.0 degree SPE angle on day 022. Recovery efforts resumed post solar conjunction on day 124, May 4th through day 178, June 27th, as the spacecraft had cleared solar interference for LGA communications. The Failure Review Board recommendations were implemented consisting of battery state of charge recovery and powering on the downlink carrier. The Green Bank Radio Telescope and the Arecibo Observatory also observed the carrier recovery tracks. To date, no downlink signal has been detected from the Behind observatory. Due to Behind's retrograde motion causing it to re-enter the region of solar interference, recovery operations will be suspended from July through November. The Failure Review Board's recommended faster frequency segmented acquisition sequence will be tested with the Ahead observatory in September. The DSN uplink arraying capability will be tested again with the Ahead observatory in October and November, and when it is ready, it will be used to increase the spacecraft received signal power to assist with Behind recovery commanding. With time the spacecraft range improves RF communications and the ability for other assets to acquire data on Behind. LGA uplink margin returns to 6 dB for the 7.8 bps rate in March 2016 and 125 bps in December 2019 and the LGA downlink margin returns to 3 dB for the 12 bps rate in December 2016 and 35 bps in March 2018.

Significant findings to date:

1. Analysis of the three DSN extracted telemetry frames from the carrier signal just before the planned observatory

reset/anomaly occurred on day 2014-274, October 1st, showed nominal performance of the spacecraft, i.e., no anomalies, IMU off, and the star tracker providing an attitude solution.

2. Post reset, from the very limited telemetry, three packets, extracted from the carrier signal by the DSN, the X-axis gyro on IMU-A had failed. Unfortunately, this telemetry contained only G&C anomaly data and no spacecraft summary data, i.e., the state of the RF, G&C, fault protection and other subsystems is not known at the time of the anomaly. With a failed IMU and the star tracker being off-line for an undetermined duration, the sun sensors will keep the observatory pointed at the Sun, though the G&C will not have any roll knowledge, and cannot roll the observatory as part of the safing configuration to re-establish communications on the LGAs. From analysis of this telemetry and initial G&C simulations, it is highly suspected that the observatory is rotating about the principal axis of inertia due to an autonomous momentum dump initiated by biased gyro data flagged good by the IMU, but this has not yet been confirmed.
3. At least two anomalies occurred post reset, the star tracker not promoting to AAD mode and the X-axis gyro failure. Unfortunately, due to the number of possible combinations, the STEREO fault protection system is not designed for simultaneous failures.

Once communications are restored and the anomaly resolved, the Behind observatory will be returned to nominal science data collection as soon as it is safely possible.